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Project Title	Using web services, Develop an Application Framework for Employee Performance Evaluation & Recognition.
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Using web services, Develop an Application Framework for Employee Performance Evaluation & Recognition.

**A dissertation submitted for the Degree of
Master of Computer Science**

Y.N.K Munasinghe.

**University of Colombo School of Computing
2019**



DECLARATION

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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ABSTRACT

The most of the companies are engaged in the area of an employee performance evaluations and recognition since, a great performance can take your business to an optimum level whereas poor performing employee can be detrimental to your company's success. Hence, definitely, the company must be identified the best human resources to achieve the company goals and objectives. In a project-based companies, the most suitable employees are allocating as human resources at the initial stage of the project. Therefore, suggesting the most appropriate and the most suitable employees for a project as resources, will be led to the success of a project. But, if any such company is unable to select the correct employees at the correct time, then the project will be failed due to inappropriate selections of an employees.

However, the manual selection of an employees is a tedious task hence, it is a time consuming and not providing the accurate results due to the biasness and the difficulty of keep all angles of hundreds or thousands of employee actions, including behaviors or the performances assessed by them. Further, if any company has unable to follow the accurate employee evaluations without any biases, the whole project will be failed since, the performance will be taken as the input for the allocation of human resources for a project.

Therefore, it is necessary to have a software-based solution which is capable enough to find out the appropriate employees for a new project, and the solution is not a straight forward way to solve the problem. So, it is used an intelligent approach to solve the problem and developed an application framework with web APIs which follows the Service Oriented Architecture (SOA), as a mechanism to conduct the performance evaluation and recognition. As the solution to the problem, developed an algorithm which can generate accurate results with less execution time. The bulk data has been involved with the process and the data load also high. Therefore, the data manipulations have been used at the database level, in order to provide the fast execution. Further, the framework has been exposed the methods to outside since, any client application can be plug in to the framework and it will provide the interoperable and cross platform services for any client. This concept is a totally new idea and it will enhance the usability and the reliability when evaluating employee performance and suggesting suitable employees for new project.

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ABBREVIATION

HR	Human Resource
UI	User Interface
CV	Curriculum vitae
ER diagram	Entity Relationship diagram
KPI	Key Performance Indicator
SOA	Service Oriented Architecture
MS-SQL	Microsoft SQL Server
HTTPS	Hypertext Transfer Protocol Secure
REST Services	Representational State Transfer services
WEB API	An application programming interface for either a web server or a web browser
XML	Extensible Markup Language
JSON	JavaScript Object Notation

CHAPTER 1: INTRODUCTION

1.1 OVERVIEW

Project based companies have to spend unnecessary time when utilizing human resources for a new project. A resource allocation is the primary step that every organization has to take, before initiating the project development. Hence, human resource allocation is a significant fact to every project and it will directly impact to the final outcome as well. Most of the companies are still following a manual process to find out the best or the most appropriate employees when selecting human resources for a new project. This is a tedious task for the selectors or the managers, since it is an impossible task to keep all angles of employee actions, including behaviors or the performances assessed by them. There should be a proper mechanism to select the most appropriate employees out of the identified number of employees for any new project. Therefore, the necessity of the software-based solution is highly needed, when considering the KPI based performance results of the employee, and the availability of such employee.

The proposed and developed web services-based application framework has introduced an algorithm that is capable of overcoming issues that surface when selecting employees for new projects.

1.2 PROBLEM STATEMENT

A project-based companies have a critical common problem when selecting or allocating human resources for newly upcoming projects. The manual selection procedure is a tedious task for the managers or the selectors since, they have to spend more time to find out the most suitable employees out of hundreds or thousands of employees for a new project and it is not practical to keep records of all the employee performances in mind. Most of the companies are still following a manual paper-based performance evaluation process and it will lead to biases. Further, the evaluation methods are not in a proper standard and there is no such software mechanism to define the evaluation measurables which will contribute towards the accomplishment of organizational objectives.

1.3 PROBLEM DEFINITION

Usually, every employee who work hard would be delighted, if the top management of the company appreciates their work performances and giving more facilities. The appraisal evaluation is the process where companies will be able to evaluate individual employees and their job performances. Organizations must assess their employee's strengths and weakness by doing a continuous appraisal evaluation. An organizational perspective, it is very much essential to determine whether an employee's skills are matched to the employee's job description. Since, the success of any company is directly affected by the performance of the employees within the organization. Therefore, it is very essential to be evaluating the employees in an organization, since employee engagement is a measurement that tell you nearly everything about the organization's overall performance. [1]

Currently, most of the companies are following a manual process in order to evaluate their employees' performances as well as they are using a software system which can use to satisfy their own requirements. Hence, the same system cannot used by any other company, since there should be a back-end development, in order to satisfy their requirement. The manual evaluation process involves labor intense work followed by consensus meetings, one-on-one discussions that would end up stacking pile of papers at your desk. Both the manager and the HR manager has to document results of every employee performances, every time, every week, month and so on and keep it updated. This will keep accumulating multiple excel sheets and over the year-end you cannot even compare between employees to come to a conclusion on who performs better and who needs improvement or assistance. [2]

When it's automated the whole process by exposing a framework, everyone can easily do their activities without spending unnecessary time. Manager's perspective, manual performance appraisal process is a tedious work, since they have spent hours, in order to fill the appraisal forms for the huge number of employees. Hence manual appraisal is a time consuming process. Managers also have to keep remembering all the competencies which are related to every employee. Sometimes managers will not be able to deliver the accurate records of the employee and it will affect to the employee next promotion or increment. Even though some organizations are using a performance management system, but they are also using a peer reviewing mechanisms. Measuring

the performance depending on one appraiser is not an accurate process, since manager's can decide the entire performance of an employee by his/her own biases.

Also, when defining the evaluation measurables such as KPIs and Competencies, most of the companies are unable to define them based on the importance level of the company. The evaluation measurables should be able to contribute towards the accomplishment of the company objectives. However, most of the companies are still using the old evaluation measurables techniques which couldn't be able to contribute to the successes of the company. Hence, there should be a software framework which will provide the rich features and to customize the functionalities based on the customer requirements.

Further, when a software project, based company initializing a project, they need to find the most suitable human resources to complete it successfully. But most of the companies have been failed to complete the projects, since they are unable to find the correct resources at the correct time. Also, management has to put an extra effort to collect the relevant resources which satisfy the employee skills and experience with the project requirements.

1.4 THE EXACT COMPUTER SCIENCE PROBLEM.

The most important computer science problem is how to provide the software-based solution for the suggestion of the most suitable employees for any new project. There are so many criteria to be checked to find out the suitable employees for new project. Therefore, the algorithm or the approach has to be used to suggest the most suitable employees as the human resources for the newly upcoming projects. This will be the most significant feature to be developed in this project. In order to build up the concept of the employee suggestion, the input parameters and the data access methods which will be used in the algorithm and the way of developing the algorithm or the approach with respect to the HR concepts, will be the most important computer science problem in this project. This project is mainly based on the HR concept or the theories. Therefore, the requirements can be changed very frequently. In order to adopt to the sudden changes, there should be a proper architecture to cater the specific requirements to the client with high usability. It is necessary to find out and develop the services-based application framework. This is another computer science challenge in this project.

The real-world problem is mainly based on human resource management concepts and theories hence, in order to cater the theories of the HR concepts in to the software solution, this will be a difficult task in this project.

Most of the project-based companies are facing this issue and if they choose wrong employee due to many reasons, the final outcome of the project will not be success as expected. Sometimes it fails. Further, large amount of data has been involved and data access from various data sources, when suggesting the most suitable employees for a project. Therefore, another computer science problem will be to handle the bulk data in the database level as much as can.

1.5 MOTIVATION

“The bad news that ignoring the performance of people is almost as bad as shredding their effort in front of their eyes. The good news is that by simply looking at something that somebody has done, scanning it and saying ‘uh huh’ dramatically improve people’s motivation.” – Dan Ariely. [3]

Main reason behind made me motivate towards developing this software which can evaluate employee performance evaluation and recognition is, this is a common and a complex process which is faced by the most of the organizations. As per the observations I have gone through, allocating an employee to a specific project which he or she is specialized or mastered is somewhat complex. As I have experienced, when the organization comes up with new projects, managers spent most of their time in selecting the best and most suitable human resources in order to make the project success. Currently this process is done manually and does not follow a specific & correct methodology. Hence organization have more chances in missing most suitable employees in succession of their projects. Employee performance is also the main criteria which decides his/her future benefits. Therefore, the performance evaluation and recognition is significant in deciding the employee benefits as well as the final outcome of the evaluation criteria can help in selection of employees towards the project allocation. If we could develop a proper and successful framework in performance evaluation, this could significantly help to change the employee’s future as well as developing in their career path.

Therefore, I recognized that addressing to a problem which is common in most of the organizations since it's time to digitalize this stage with proper framework, processes and procedures in order to make the business success in today's business world.

1.6 OBJECTIVES.

O1). To find out the software mechanism to suggest the most suitable employees for any project.

This is the primary objective of this project since, the most of the organizations are struggling when allocating the most suitable employees as the resources for new upcoming projects. The manual process is a tedious task for every manager who is involved for the resource allocation hence, it will take unnecessary time and they will have to do an extra work, in order to find out best matching resources for the project requirements. Hence, it needs to cater this problem into the software-based solution with using appropriate software mechanism to automatically suggest the most suitable employees according to the given project.

O2). To figure out the best software mechanism to create the employee performance evaluation measurables of individual tasks of employees which will contributes towards the accomplishment of organizational objectives.

The performance evaluation measurables are very significant key indicators when conducting the employee appraisals. Hence, the measurables should be more accurate and there shouldn't be any conflicts with each other. In order to satisfy the requirement, there should be a proper software mechanism with the mathematical concept which can define the evaluation measurables to contribute towards the accomplishment of organizational objectives.

O3). To provide a software framework, in order to expose the functions to create customize evaluation forms/performance measures and grading point mechanism, according to the given company requirements.

To address the all problems, it is essential to provide the software framework which can expose the methods to any client applications since framework provides a standard way to build and deploy applications. A software framework is a universal, reusable software environment that provides particular functionality as part of a larger software platform to facilitate development of software applications, products and solutions. [4]

1.7 SCOPE

This is a web based mobile responsive web application which will be developed on top of the framework where every employee can access through computers, mobile phones and other smart devices. According to the company requirements, the framework can be implemented for any organization or the company under specific domain. The proposed system can be categorized in to two sections. The first part of the proposed system will provide the facility to do the employee performance evaluation. The second part of the proposed system will be able to suggest the appropriate employees for any new project based on the marks which are gained from KPIs, competencies and other attributes.

The appraisal evaluation forms can be generated according to the organization's requirements. The framework will allow to define the customizable performance measures such as Key Performance Indicators (KPIs) and Competencies based on the company's needs as well as it will be able to create their own grading point mechanisms. The framework will be able to facilitate a 180/360-degree feedback process as their employee's performance evaluation. Those who have the permission, they can review the individual employee performance as well as the performance of the departments and compare the details with previous years.

When assigning the points for KPIs for a particular employee, a framework will analyze the past performance evaluation data to generate the average grading point that they have earned during his/her past evaluations.

The second part of the project is, suggesting the most suitable employees for any new project by using an algorithm which takes the different data from various data sources through web services such as performance evaluation marks, project filter variables and the priority level of the KPIs that are required for the project.

1.8 RESEARCH CONTRIBUTION.

The research contribution of this project is suggesting the most suitable employees for a project, based on the inputs such as KPI values, skill level of the employee, experiences and etc. The framework will rank all the employees by mentioning, why they are suitable for a project. When ranking the employees, the framework is looking at the past data set as well as the variables which are defined by the user. The Framework will be able to collect the data from different sources through the web services and process an algorithm to list down the ranks of the employees.

In order to filter the employees, the framework has to process and manipulating the data depending on the variable parameters and the performance of the employee. The performance level of the employee can be measure by the KPIs and competencies.

Further, the framework will suggest the average KPI value for each defined KPI of each employee depending on the past years of historical data to reduce the biases.

Thus, the research contribution of this project is to provide a high usable and accurate computer based solution which can cater the HR concepts and methodologies based on the service-oriented architecture.

CHAPTER 2: LITERATURE REVIEW

2.1. OVERVIEW

Now a day's most of the companies are functioning in a competitive environment. Companies should be able to respond quickly to changing customer demands and other factors to survive in the market. Every organization perform its tasks with the help of resources as manpower, machines, tools, and financial resources. Manpower is a live and can be used to generate other resources as well. So, the human resource utilization is a significant factor for every company to achieve the company mission, vision, goals and objectives. Hence, most of the organizations use a different approach to utilize their human resources. However, half of them are unable to follow the accurate procedures when they measure their employee's performances and the organizations have failed to allocate or select the most appropriate employees for a new project to satisfy the project requirements.

2.1.1. History of performance evaluations

Employee performance evaluation is not a new concept. It has changed a lot over the last 100 years. Let's take a closer look of an Employee Performance Evaluation over the years.

➤ Early 1900s: The Performance Appraisal's Informal Beginnings

According to sources until mid-century formal appraisal systems were not implemented by many organizations even though, WD Scott had introduced and invented the concept of performance appraisal as early as World War II. Organizations had not adopted this concept after initial introduction due to lack of recognition of the system and procedures.

➤ **1950s: Developing a Formal System**

Organizations had started using personality-based systems in terms of measuring performance by the mid-1950s, when formal methods of performance appraisals were widely known among companies. Towards the end of the 1950s be that as it may, an unease at these concepts started to create, as not exclusively was there no component of self-appraisals, yet the personality-based approach contributed less in monitoring performance rather, it observed the individual's personality.

➤ **1960s: Measuring Objectives & Goals**

During 1960s main focus was centered towards self-appraisal and the main purpose of performance appraisal systems was revolve around identifying the capabilities of individuals and achievements in the future.

Along 1960s, performance appraisal systems evolved while aiming on goals and objectives and more advance methods of self-appraisals. These improvements gave them the benefit of assessing individuals' performance in a more advance manner.

➤ **1970s: Finding Flaws**

During 1970s, there was a considerable measure of feedback about how appraisals were being directed, and a few cases were even indicted. A great deal of this was down to how abstract and opinion based most appraisal systems were, thus as the 1970s unfold, organizations began including much more psychometrics and rating scales.

➤ **1980s – Early 2000s: Holistic Measures**

The following 20 years saw an expansion in organizations concentrating on employee engagement and commitment, which prompted a more encompassing way in performing appraisals and performance management. Organizations started estimating metrics as a component of their evaluation procedure, for example, mindfulness, correspondence, collaboration, ability to handle emotions and the conflict reduction. A significant number of these are still extremely important in performance surveys right up 'til the present time.

➤ **Modern Day Performance Management**

In recent years, performance management has evolved even further, with many companies pulling down the traditional hierarchy in favor of more equal working environments. This has led to an increase in performance management systems that seek multiple feedback sources when assessing an employee's performance – this is known as 360-degree feedback. [5]

2.1.2. Performance appraisals and process.

According to Carl Heyel Performance appraisal is defined as "It is the process of evaluating the performance and qualifications of the employees in terms of the requirements of the job for which he/her is employed, for purposes of administration including placement, selection for promotions, providing financial rewards and other actions which require differential treatment among the members of a group as distinguished from actions affecting all members equally." [6]

Every company has setup an objective to achieve the company goals. Achievement of targets totally depends on the performance of individual employees. The objectives can be satisfied if an employee performed well. Hence it is a significant to understand the level of success at their jobs for achievement of their goals. The management should be able to know the exact position about the status of the targets. Otherwise, they will not know the progress of their tasks and ultimately, they will fail the final achievement. Hence it is an essential to carry out the performance appraisal process throughout a year.

Performance appraisals can be used as a basis of reward allocation such as salary increments, promotions, and other benefits, etc. Also, it will assist to identify the weaknesses and the difficulties that the employees faced during performing their tasks. Employee appraisals is a very old concept. In old approaches, employees will get their salary wages based on the output of tasks. If the output was good, then employees were paid a good salary and if not, there was a cut in their wages. There was less involvement of human to the appraisal systems. Old appraisal systems were failing to highlight the personal development of the employees. However, modern approaches are totally

different compared with the old approaches. Since, the performance of employee is measured and discuss with the objectives to find out the strengths and Weaknesses. The management gives their maximum attention for their employee's individual appraisal evaluations. Since, it may lead to utilize the resources and ultimately the company will get the benefit from it.

A performance evaluation is done by the managers or supervisors. Sometimes their decisions might not be accurate due to human errors. A common human error when evaluating a performance of an employee can be list down as follows,

1. Halo Effect

Appraisers will give their ratings based on one dimension and others are neglect. However the final outcome will not success due to this Halo Effect.

2. Central Tendency Error

Raters avoid making "extreme" judgment when evaluating performance appraisals. They will follow the central path. This could help for an employees who are not perform well.

3. First Impression Error

First impression error is the rater's tendency to let their first impression of an employee's performance carry too much weight in evaluation of performance over an entire rating period. [7]

4. Recency Bias

Basing the evaluation on the last few weeks rather than the entire evaluation period. [8]

5. Leniency Error

All employees rated at the positive end or low rate at the negative end.

2.1.3. Methods of Performance Appraisals.

Performance appraisal is an annual process that involves evaluating employee's performance and productivity against the pre-determined set of objectives for that year. It also helps to evaluate employee's skills, strength and shortcomings. The results of this performance appraisal determine the employees wage raise and promotion. [9]

Before starts the appraisal process every manager should be able to identify the most suitable performance appraisal method. The choosing unsuitable appraisal method can be compromising the whole process. A wrong choice of method would bias results that would eventually result in to faulty human resource decisions. A faulty appraisal could result into frustration of employees and creation of environment of injustice. Although all the methods are aiming to appraise the performance. But each suffers from a different kind of drawbacks. However, managers could find out the most suitable method, according to their cultural environment.

A Performance appraisal method checks all the activities during the assessment. The human resource philosophy is instrumental in influencing the choice of appraisal method must be chosen to bring outcome in accordance with the overall objectives of the organization. The organization has to make a choice to select a method that serves its purpose in a best way. All methods of appraisals can divide into two different categories and there are several appraisal methods exists under these main categories. Traditional methods of performance appraisals such as annual performance reviews suffer from major limitations since, they focus more on measuring past performance rather than improving future work. [9] Hence, in this project also 360-degree feedback process is used in order to improve the future work of the employee. A 360-degree feedback is a process through which feedback from an employee's subordinates, colleagues, and supervisor(s), as well as a self-evaluation by the employee themselves is gathered. Such feedback can also include, when relevant, feedback from external sources who interact with the employee, such as customers and suppliers or other interested stakeholders. [10]

Methods of Performance Appraisals	
Past Oriented Method	Future Oriented Method
✓ Rating Scales	✓ Management by Objectives
✓ Checklist	✓ Psychological Appraisals
✓ Forced Choice Method	✓ Assessment Centers
✓ Forced Distribution Method	✓ 360-Degree Feedback
✓ Critical Incidents Method	✓ Human Resource Accounting
✓ Behaviorally Anchored Rating Scales	
✓ Field Review Method	
✓ Performance Tests & Observations	
✓ Confidential Records	
✓ Essay Method	

Table 1 : Methods of Performance Appraisals.

2.1.4. Mathematical calculations of weighted average KPIs and Competencies.

A Key Performance Indicator (KPI) is a metric that measures the performance of a particular activity or process. The objective is for this to serve as a reference depending on the process or activity on the basis of the objective you want to achieve. [11] The characteristics of KPIs such as concrete, measurable, reachable, and relevant need to be embraced when defining the KPIs for an employee job role.

The top rank HR systems such as “OrangeHRM”, “Bamboo HR”, and “Cake HR” are not facilitating to define the weights for the KPIs and Competencies. Those systems are allowing to define the KPIs without using the weighted average calculations. A Simple arithmetic mean gives equal importance to all items in a series. In some cases, all the items in a series may not have equal importance. In such cases, instead of simple arithmetic mean, weighted average is the appropriate method. The Weighted Average or the Weighted Mean is used when the relative importance of the items in a series is not same for all items. In this case, each item is judged based on its relative importance.

[12] Therefore, the weighted average KPIs are very important for the organization since, the weight of the KPI will be decided based on how much the KPI is important from the company perspective.

The competency is a combination of observable and measurable knowledge, skills, abilities and personal attributes that contribute to enhanced employee performance and ultimately result in organizational success. [13] The weighted average mathematical calculations can be used for the competencies as well. Further, it is very much significant mechanism to evaluating a person by proving mathematical calculations like weighted average calculation.

2.1.5. Employee recognition and allocating suitable human resources.

In a controlled workplace context, we have shown that provision of public recognition to employees causes a statistically and economically significant increase in performance. [14] Employee recognition is key to preserving and building the identity of individuals, giving their work meaning, promoting their development and contributing to their health and well-being. It also represents a constructive alternative to control- and monitoring-oriented management styles. [15] Hence it is very much essential to know the ways to boost an employee performance with recognition.

The suggestion engine concept which is used to suggest and allocate the most suitable employees for any project, is not developed in existing software solutions. In existing systems, they do not use any automated recognition techniques. The proposed framework is addressed the employee recognition and allocating them to any new project via a suggestion engine which is run an algorithm on top of the application framework.

2.1.6. Service-oriented architecture (SOA) with the framework.

Service-oriented architecture (SOA) is a style of software design where services are provided to the other components by application components, through a communication protocol over a network. The basic principles of service-oriented architecture are independent of vendors, products and technologies. A service is a discrete unit of functionality that can be accessed remotely and acted upon and updated independently, such as retrieving a credit card statement online. [16]

This project is connected with HR methods and theories since, the requirements can be changed frequently. Therefore, reusability of the framework should be high. SOA brings better reusability of existing assets or investments in the enterprise and lets it create applications that can be built on top of new and existing applications. SOA enables changes to applications while keeping clients or service consumers isolated from evolutionary changes that happen in the service implementation. SOA enables upgrading individual services or services consumers; it is not necessary to completely rewrite an application or keep an existing system that no longer addresses the new business requirements. Further, SOA provides enterprises better flexibility in building applications and business processes in an agile manner by leveraging existing application infrastructure to compose new services. [17]

The project is dealing with many requirements and services. Therefore, WEB API is a good mechanism to expose the services to client applications via APIs since, the WEB API is a part of a SOA which enables the REST services. An API supports multiple text formats like XML, JSON etc. Further, WEB API is an open source and based on light weight RESTful architecture.

Thus, WEB API with Service-oriented architecture is the best match to develop the framework to satisfy the requirements and the objectives of the entire concept and the project.

2.2. RESEARCH GAP

According to the literature survey, I have identified that most of the companies have already started to follow an employee performance evaluation using a software based application, since an employee performance evaluation is emphasized the fact that people are key to productivity gains. However, there are some identified gaps between my proposed software framework with current existing software solutions.

2.2.1 Comparison with existing solutions.

There are few employee performance evaluation and recognition software based applications exist in the current market. Some of them such as “OrangeHRM”, “Bamboo HR”, and “Cake HR” and “IFS Application”. There are some features that is not addressed by the top-ranking existing software solutions over my proposed framework.

	Orange HRM	Bamboo HR	Cake HR	IFS Application	Proposed Framework
180 degree evaluation	✓	✓	✓	✓	✓
360 degree evaluation	✓	✓	✗	✓	✓
Weighted average KPIs/Competencies	✗	✗	✗	✗	✓
Employee suggestion engine.	✗	✗	✗	✗	✓

Table 2 : Comparison of existing popular systems.

2.2.2. Configuring customizable KPIs and Competencies with weighted average calculations.

The top existing systems which are in the current market such as “Orange HRM”, “Cake HR”, “Bamboo HR” and “IFS Applications” are facilitated to define the KPIs and Competencies without any weight assigning, in order to make the evaluation forms. However, the proposed framework is facilitated to define the KPIs and Competencies with preferred weight additions.

The major reason is to use the weighted average calculations when defining the KPI is, the company can give some weight to the KPI according to the company preference. This will indicate how much that KPI is important to the company and how much of contribution that the company will looking from an employee. The following example will describe about the reason of the worthiness of using the weighted average KPIs.

Example: - There can be few employees who is getting more leaves but they may have delivered the quality product within the deadline. Another group of employees can be exist with good attendance but they may be fail to deliver the quality product. In this kind of situations, the company could decide whether they need to give the priority by assigning weight for the attendance KPI or the quality of work KPI.

2.2.3. Suggest the most suitable human resources for any projects by mapping the KPIs with the project requirements.

When a project-based Software Company initializing a project, they need to find the most suitable human resources to complete it successfully. But most of the companies have been failed to complete the projects, since they are unable to find the correct resources at the correct time. They are wasting their valuable time to find the resources by checking the employee’s CVs, ask from the immediate supervisors about their employees and etc. Even though, if they found such information, they will not be able to get the accurate human resources and some important resources can be missed.

According to our proposed framework, it will suggest the most suitable human resources for any project by mapping the KPIs with the project requirements and filter the identified employees using skill level, education, and experience.

The suggestion engine concept has not been developed in top existing software solutions like “Orange HR”, “Cake HR”, “IFS Application” and “Bamboo HR”. This is a new concept which make manager’s life easier when selecting the most appropriate employees for any project.

2.3. LIMITATIONS.

- When there are salary augmentations, Finance department will check the company budget and update their feedback. There is no integration with finance module.
- KPI measurements will not be changed at least for 3 years.
- Selecting most suitable employees for a project is mainly targeted for software project-based companies.
- Only consider the KPIs for the suggestion engine.
- The proposed solution is a framework and not the software solution. As this is a framework, any company could be able to use the solution with few configurations according to the organization’s requirement.
- If any company follows the 360-evaluation process, only 2 members of the same department will be participated for the evaluation.

CHAPTER 3: METHODOLOGY

3.1. PROBLEM ANALYSIS

Employee review is a key component to measure an individual's performance in each and every company. It helps employees to set right goals and facilitates better working relationships. [18] However, if companies ensure the fair appraisals to their employees, it can be the best way to boost employee engagement and the productivity of the company. Hence, everyone should follow the fair appraisals in order to prepare the happy environment for every employee. According to the literature survey, most of the companies are following a manual process for evaluate the employee performance appraisals and there are some drawbacks in the evaluation measurables as well. Therefore, this is a tedious task for everyone in the company. Sometimes managers can decide the entire performance of an employee by his/her own biases.

Further, when a project-based company initialize a project, they need to find out the most suitable human resources to allocate for the project, in order to complete it successfully. But some of the companies have been failed to deliver the projects within the deadline since, they are unable to find out the correct resources at the correct time. There is no proper human resource utilization mechanism for suggesting the most suitable employees, if there is any new project is arrived for the company. In many organizations, the management has to randomly pick some employees, based on their availability and assign a new job duty without monitoring whether he/she is suitable for a project.

3.2. PROPOSING MODEL/DESIGN

The framework is providing a one-time configuration for any company to continue their evaluation process without changing the back-end development. Some existing applications doesn't provide to customize the performance measures as they need. Current employee evaluating systems, nor will analyze past data or provide with an overview of past evaluations of the appraises. In proposed system, when an appraiser is doing the evaluation, they can view average of past records for the particular KPI for that appraise. Therefore, this provides a rough overview of the appraiser's variance in performances to higher management and the appraisers.

As the solution for the identified problem analysis, a new concept called "suggestion engine" has been developed, in order to suggest the most suitable employees for a new project. The following facts have been taken as the inputs for the engine.

- ✓ The individual KPI result is mapped with the project requirements.
- ✓ The results of the employee performance evaluations.
- ✓ Project requirement filters such as experience, skills and education.
- ✓ The availability of the employee.

Further, when generating the evaluation results, the accurate HR methods and concepts have been applied. Specially, when defining the evaluation measurables such as KPIs and Competencies, the mathematical approach which is called a weighted average calculation has been used to define the KPIs and Competencies.

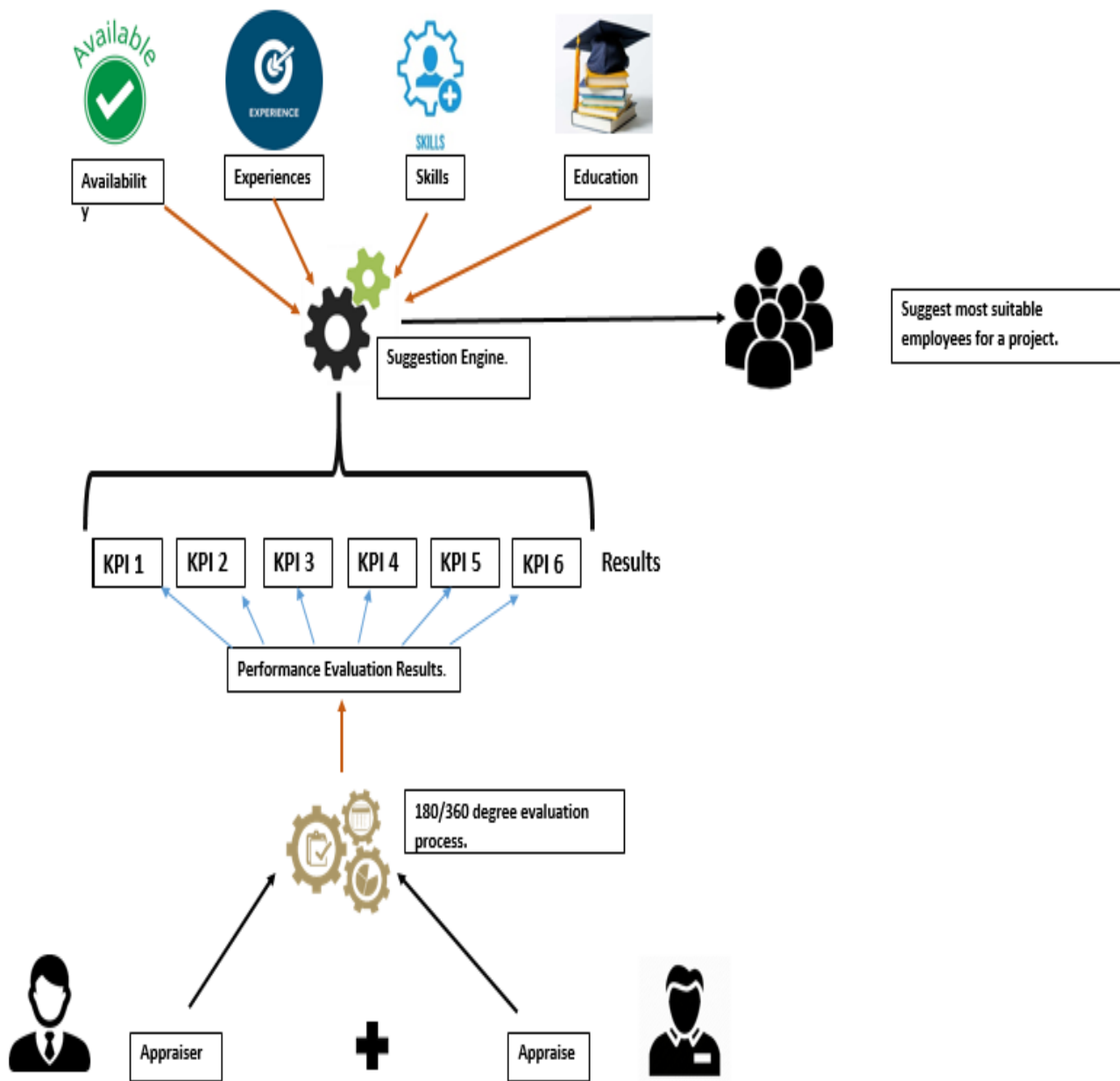


Figure 1: High Level Diagram

The framework is used weighted average mathematical calculations to get the accurate final grading mark for the employee evaluations. The weight of the KPI has been decided based on how much it's important for the company and the how much of contribution that the company is looking for. These weights have to be assigned by someone who knows about the metrics which are very significant for the company. Also, the company itself could decide the maximum value for the KPI obtain by each employee.

The total weighted average mark will be calculated as follows,

M_i : - The mark scored by the employee for each KPI/Competency in their employee evaluation.

V_i : - The maximum value for the KPI/Competency which is defined by the company.

W_i : - Weight for the KPI/Competency.

W : - Total KPIs weight.

N : - Total number of KPIs.

Total weighted average score for KPIs =

$$\frac{\sum_{i=1}^N ((M_i/V_i) * 100) * W_i}{\sum_{i=1}^N W_i}$$

Equation 1 : Weighted Average Calculation for KPI/Competency

The above calculation could be used for the competencies as well.

Once the average score for KPIs and Competencies are calculated, the company will be decided as to how much amount that needed to be contribute from the average score of the KPIs and Competencies for the final score of the employee evaluation.

Final Score =

$$\left[\begin{array}{l} \text{Weighted} \\ \text{average} \\ \text{score for} \\ \text{KPI} \end{array} * \begin{array}{l} \text{Contribution for the final} \\ \text{score from KPI as a} \\ \text{percentage which is} \\ \text{defined by the company} \end{array} \right] + \left[\begin{array}{l} \text{Weighted} \\ \text{average score} \\ \text{for} \\ \text{COMPETENCY} \end{array} * \begin{array}{l} \text{Contribution for the} \\ \text{final score from} \\ \text{COMPETENCY as a} \\ \text{percentage which is} \\ \text{defined by the company} \end{array} \right]$$

The below example will demonstrate further, how the calculation will be done when the employee grading is making,

(KPI/Competency)	Weight	Employee (Mark for each KPI/Competency)
KPI 1	W_{K1}	$(M_{K1}/V_{K1}) * 100 = R_{K1} \%$
KPI 2	W_{K2}	$(M_{K2}/V_{K2}) * 100 = R_{K2} \%$
Competency 1	W_{C3}	$(M_{C1}/V_{C1}) * 100 = R_{C3} \%$
Competency 2	W_{C4}	$(M_{K1}/V_{K1}) * 100 = R_{C4} \%$

Table 3 : Example of weighted average calculation of KPI and Competency.

$$\text{Weighted Average for KPI (S}_k\text{)} = \frac{W_{K1} * R_{K1} + W_{K2} * R_{K2}}{W_{K1} + W_{K2}}$$

$$\text{Weighted Average for Competency (S}_c\text{)} = \frac{W_{C3} * R_{C3} + W_{C4} * R_{C4}}{W_{C3} + W_{C4}}$$

$$\text{Total Mark} = (\text{S}_k * \text{Contribution of KPI } \%) + (\text{S}_c * \text{Contribution of Competency } \%)$$

3.2.1 Suggestion Engine

The final stage of the framework is to suggest the most suitable employees, when there is a new project arrival for the company. The suggestion engine is mainly depending on employee evaluation marks which are earned for KPIs, project filters, availability of the employee and etc. After suggesting the suitable employees, the end user has the capability to allocate the most appropriate employees according to his/her preference.

The suggestion engine is divided in to two main components and there are some sub components as well.

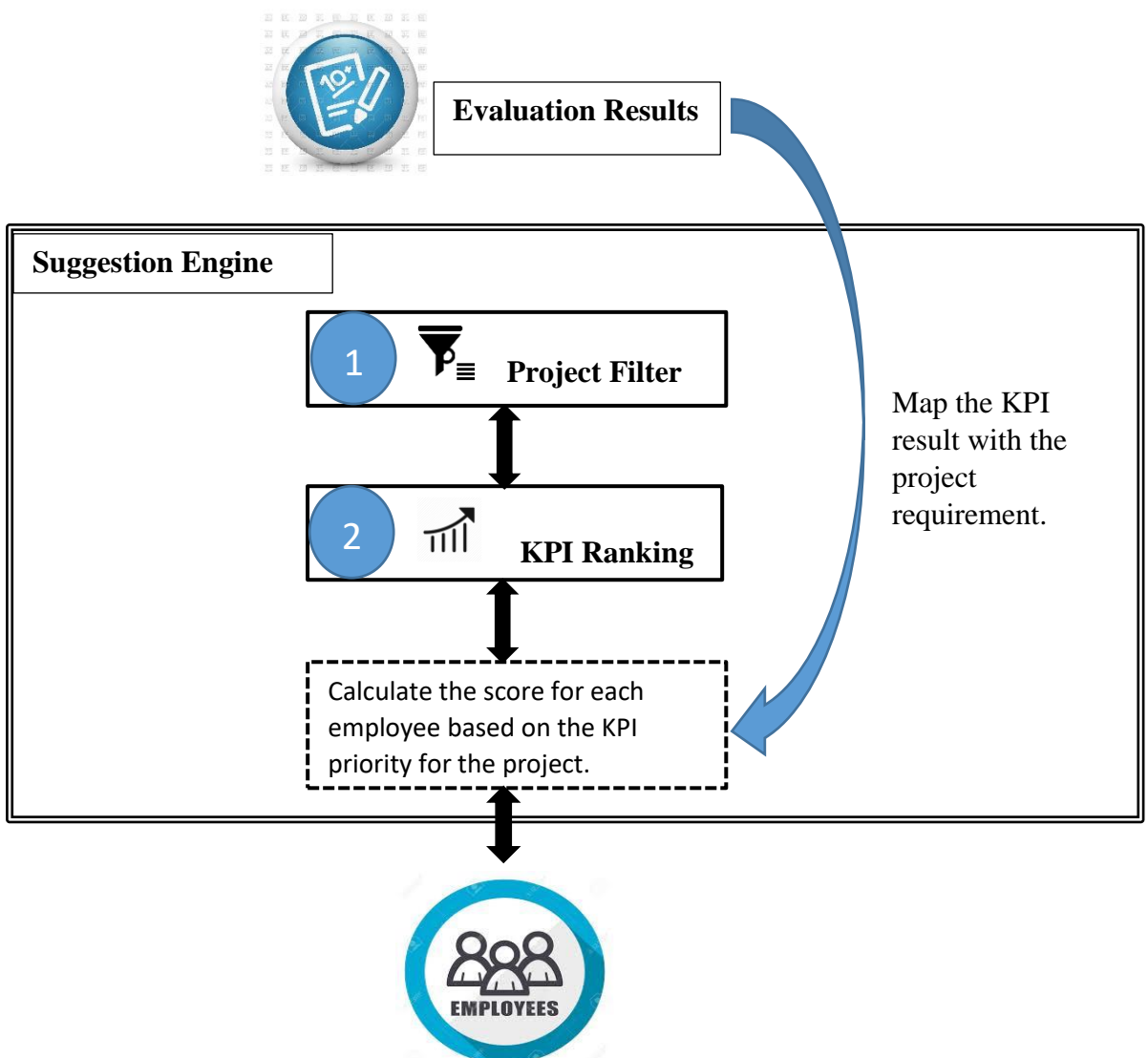


Figure 2 : Suggestion Engine.

3.2.1.1 Project Requirement Filter.

The first stage of the suggestion engine is project requirement filtering where the end user will be able to filter the employees for a project, based on employee's education level, experience of the employee and the skills. The suggestion engine will filter the employees at its very first stage by grouping the employee roles. After completing the first stage, the end user will be moved on to the second stage where the engine will have to prioritize the KPIs according to the project requirements.

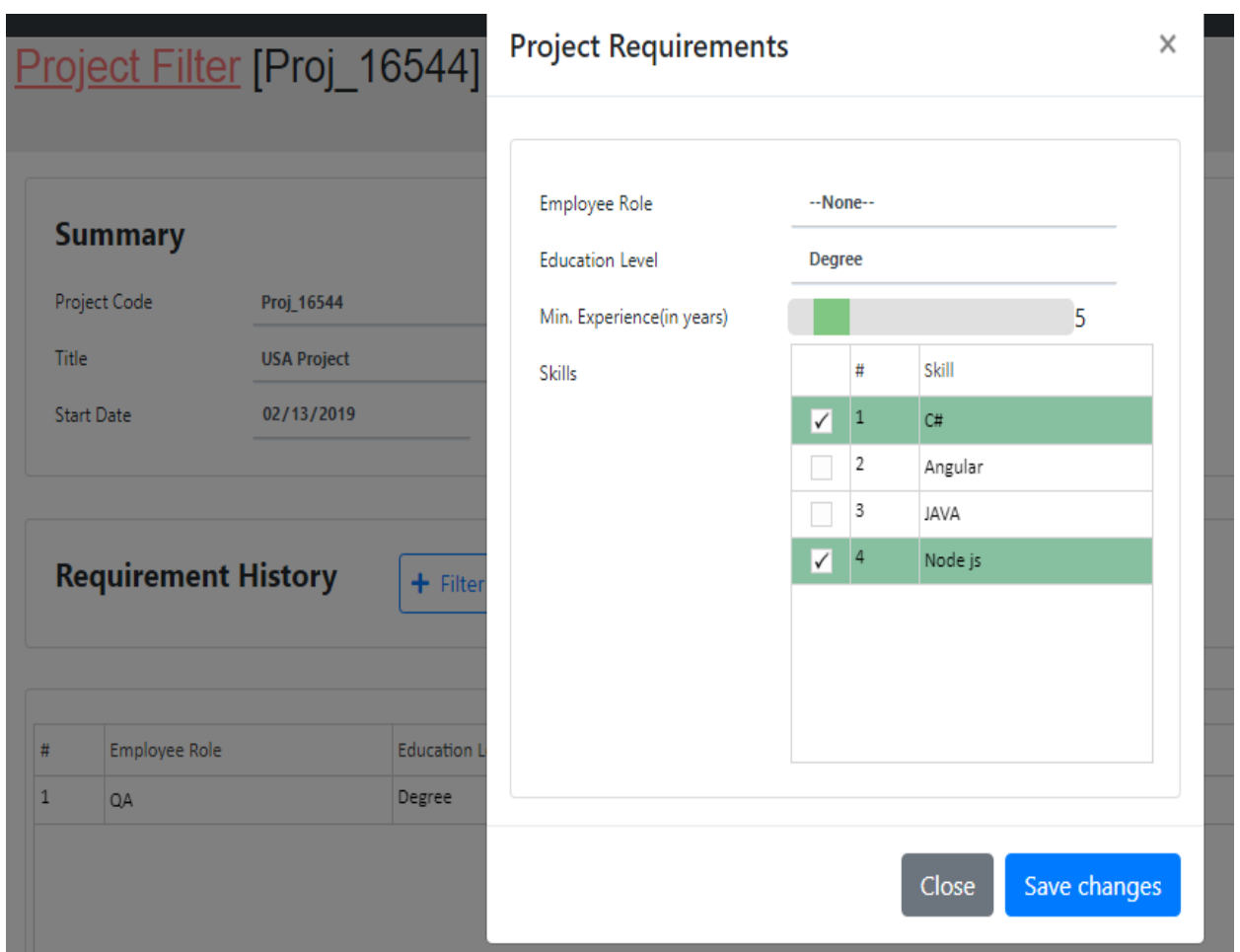


Figure 3 : UI - Project Requirement Filter.

3.2.1.2 KPI Prioritization.

The employee roles which are used in first stage of the suggestion engine is carrying forward to this KPI Prioritization stage. The end user will be able to prioritize the KPIs depending on the project requirements. Once the KPI ranking has done, the framework will assign a weight for each KPIs automatically in descending order.

KPI Selection

KPI List

Project Code: Proj_16544

Employee Role: QA

[Update](#)

[Checkout](#)

#	KPI Title	KPI Description	Priority	Weight
1	KPI4_QA	KPI 4 Desc	6	7
2	KPI5_QA	KPI 5 Desc	7	6

Summary

Employee Role

#	Employee Role	KPI Id	Priority	Weight
▼ Employee Role: Software Engineer (3)				
2	Software Engineer	1	6	6
3	Software Engineer	2	3	228
4	Software Engineer	9	228	3
▼ Employee Role: QA (2)				
6	QA	10	6	7
7	QA	11	7	6

Figure 4 : UI - KPI Ranking.

KPI	Priority	Weight
1. Business Analysis	1	4
2. Meeting Deadlines	2	3
3. Process Testing	2	3
4. Maintaining Company Standards	3	2
5. Quality of work.	4	1

1. Priorities are defined by the end user.
2. Automatically assign the weights in descending order.

Figure 5 : Assigning weights for the given priority of KPI.

After completing the second stage of the suggestion engine, framework will calculate the final score for each employee, based on the KPI priority for the project. In order to calculate the score, framework will be able to use the weighted average method by using historic evaluation results for each KPI from the past appraisal evaluations of the employee and the weight which are assigned by the end-user.

$$\text{Score} = \frac{\sum_{n=1}^n (\text{KPI Weight} * \text{Average KPI mark gained from the past appraisals})}{\sum_{n=1}^n \text{Total KPI Weight}}$$

(Weighted Average)

n = Number of KPIs selected by the end user

Equation 2 : Weighted Average Calculation for KPI Prioritization.

Based on the final score and the filter variables, the engine will suggest the suitable employees to the end-user and he/she has the opinion to allocate the employees for a project.

The suggestion engine will display the suitable employees based on their employee roles as follows,

Software Engineers				
Employee	Experience	Score	Availability	
<u>Kasun</u>	5 Years	80%	Yes	✓
<u>Chamara</u>	3 Years	75%	After 1 month	✗
<u>Anjana</u>	1 Year	60%	Yes	✓

Project Manager				
Employee	Experience	Score	Availability	
<u>Isuru</u>	5 Years	80%	Yes	✓
<u>Akila</u>	2 Years	58%	Yes	✗

QA Engineer				
Employee	Experience	Score	Availability	
<u>Kamal</u>	2 Years	58%	Yes	✓

Figure 6 : Final Result of Suggestion Engine.

The framework is built up on using Microsoft ASP.NET Visual Studio as the main platform. A front-end technology such as JavaScript, jQuery has been used for the client side and data is accessed through the WEB API controls. MS-SQL is used as the Database to store the data.

The framework is provided the services to the client applications through WEB APIs and it follows the Service Oriented Architecture (SOA). The any client can request the application services as a HTTPS requests and the WEB API provided the response as a JSON/XML data by default. The framework can be work as an independent module and it is exposed the methods to outside since, any client applications can be plugged in to the framework as per the requirement of the organization. Hence, any language independent applications can be developed and it is maintained the interoperability as well. Further, REST API request will pass to database server as per the request from the application and respond accordingly.

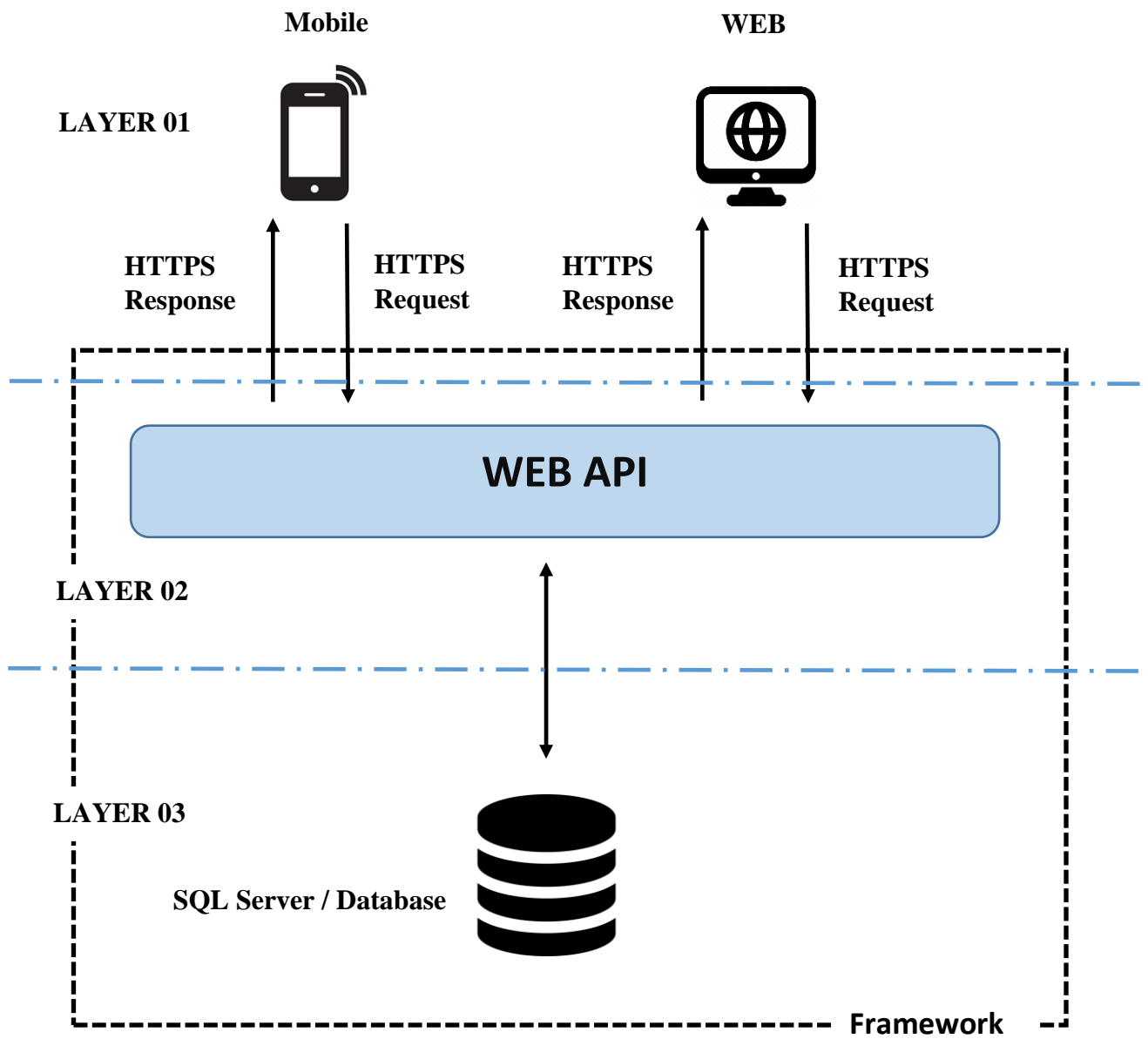


Figure 7 : SOA Architecture for the System.

There are 3 main stakeholders which I have identified to address this real-world problem.

Administrator: - He is the one who has the authority to configure the framework features.

Appraiser: - Appraiser is a special kind of an employee, who can act as a manager (appraiser) as well.

User: - This is a normal user and most of the time Normal user will be an appraisee.

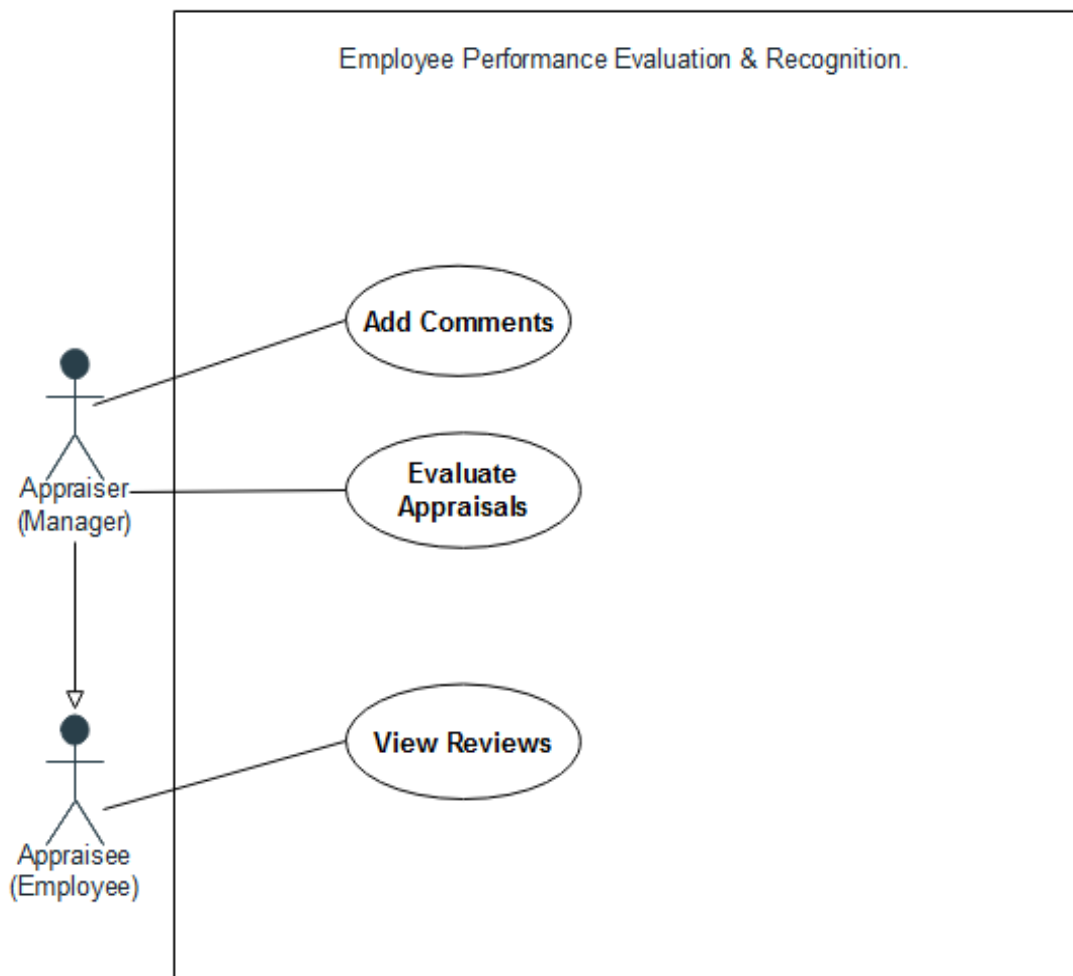


Figure 8 : Use Case Diagram for Appraiser and Appraisee.

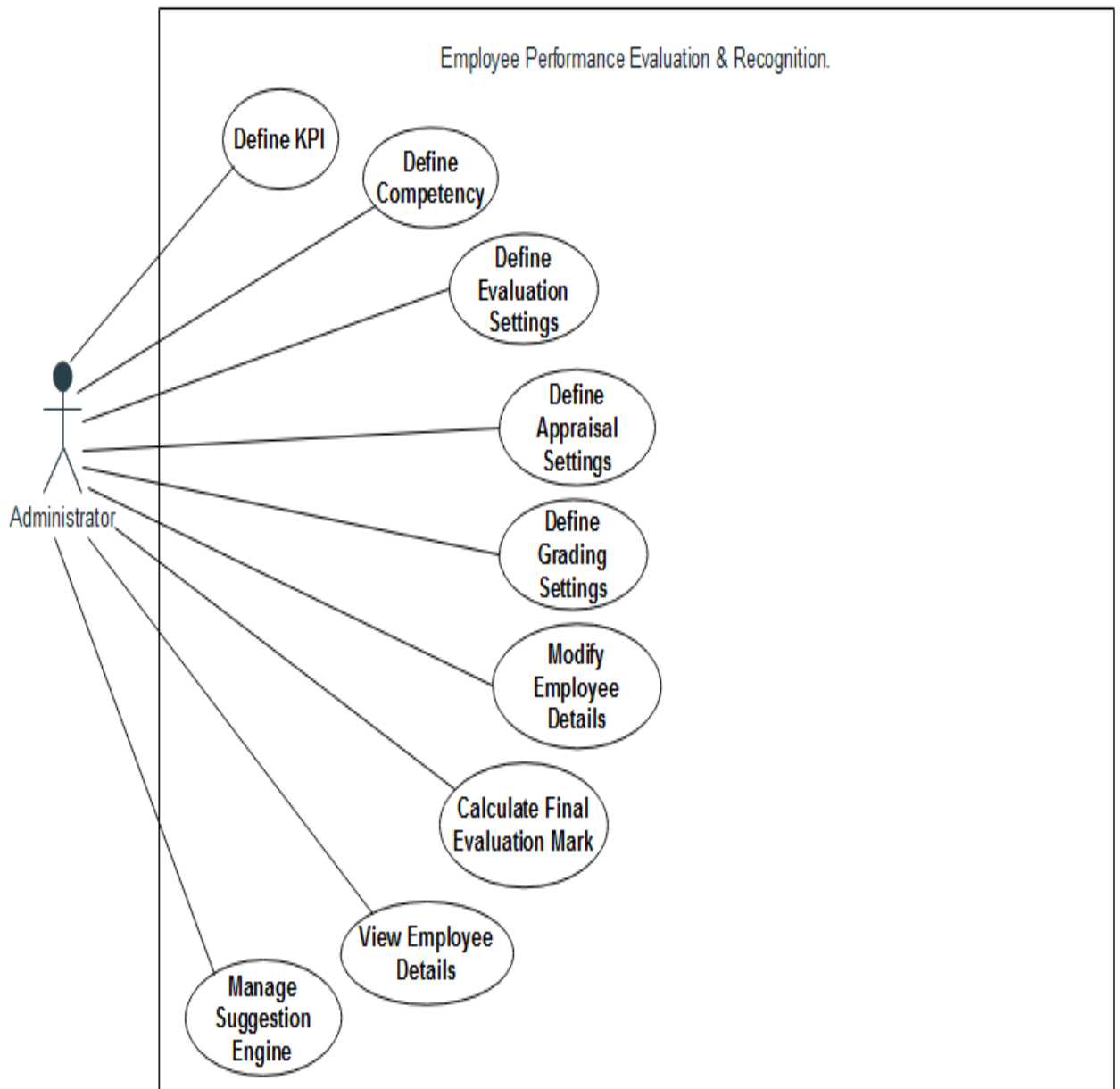


Figure 9 : Use Case Diagram for Administrator.

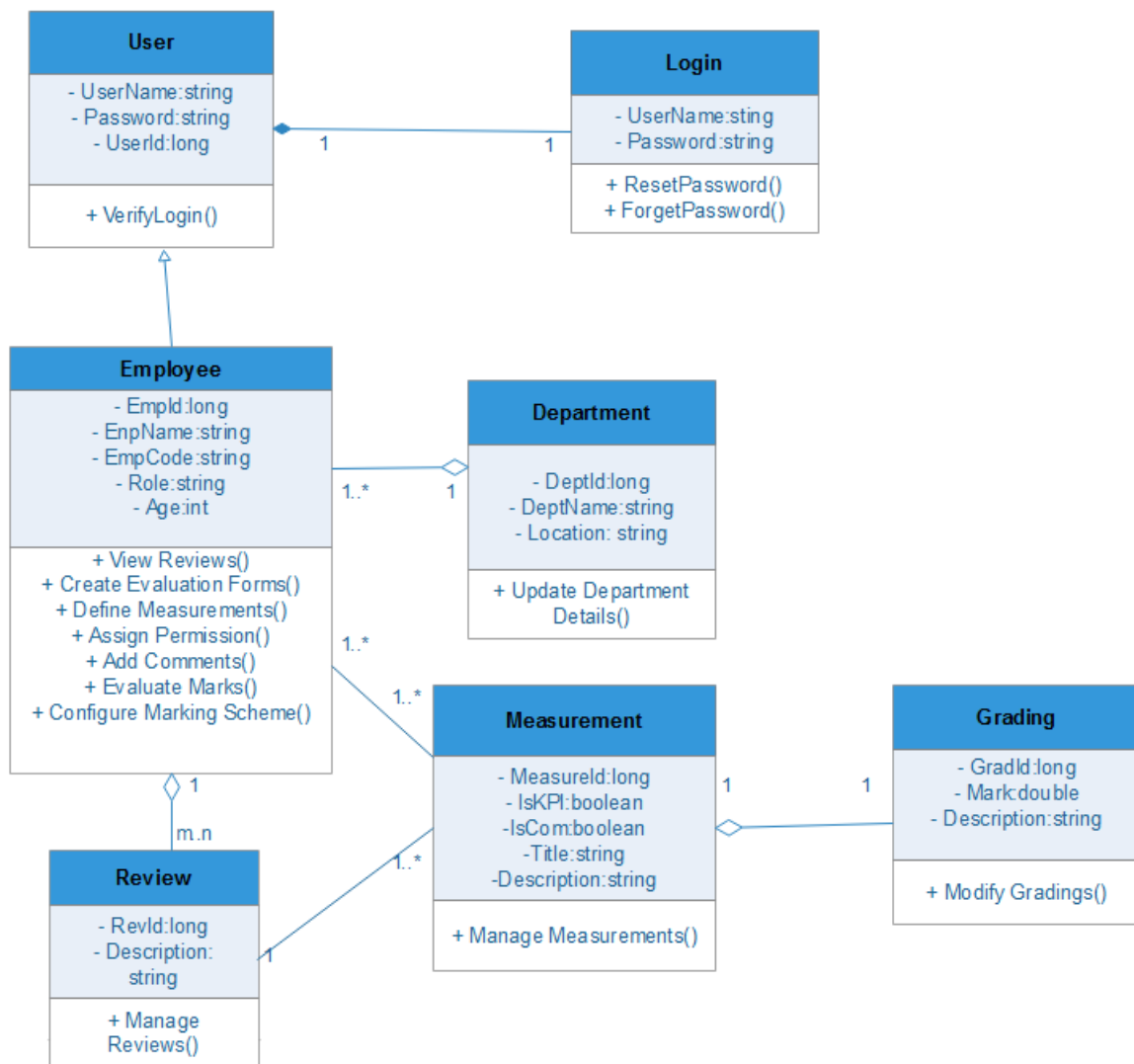


Figure 10 : Class Diagram.

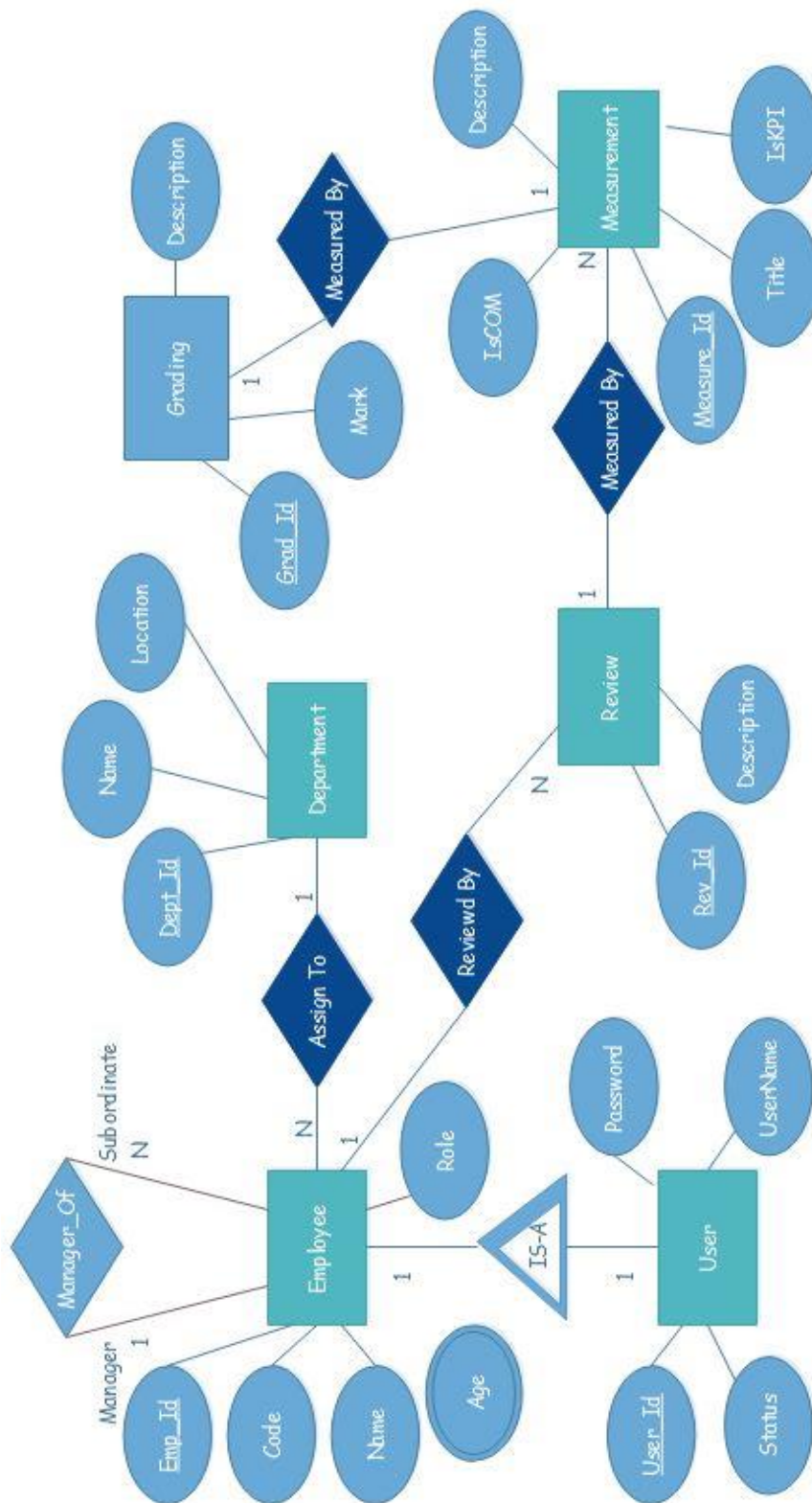


Figure 11 : ER Diagram.

CHAPTER 4: EVALUATION PLAN

This project is proposed and developed a new concept for the part of the field of human resource management. The new concept is addressed a commonly occurring problem in most of the organizations. Hence, this approach and the concept has to be evaluated with respective audience. Because, the project evaluation is a process used to determine whether the design and delivery of a project were effective and whether the proposed outcomes were met. [19] Therefore, I have chosen IT and non-IT persons for the evaluation criteria since, there can be non-technical person who is involved to select the most appropriate employee for any project.

Initially, I have discussed about the human resource methodologies and concepts with the HR team of my current working place and got their opinion, in order to continue the development of the project. Further, I have done the survey (survey 01) to make sure the necessity of this project to be developed. In order to do that I have created an online “Google Form” and got the feedback from various people who are work in different sectors.

The second survey (survey 02) is conducted to verify and validate the solution. This survey consists of 2 parts,

- Evaluation of the concept and the system (Part A)
- Evaluation of weight based KPIs (Part B)

4.1 Survey 01 - (Mainly focused on the necessity of the project or the software solution)

The survey 01 has been done for the IT and non-IT people who are worked in different working sectors with different experience. There are 7 questions included in the survey and each question carries 4 answers. The 5 main questions have been counted for the final result and each question can get maximum of 4 marks. Here is the mark categorization for the 4 answers,

Answer	Mark
Strongly Yes	4
Yes	3
Maybe	2
No	1

Table 4 : Mark categorization – Survey 01.

According to the survey results, the detail summary of each question can be listed down as below,

Question 01: -

Do you think 360 degree performance evaluation is a good method to evaluate an employee performance?

25 responses

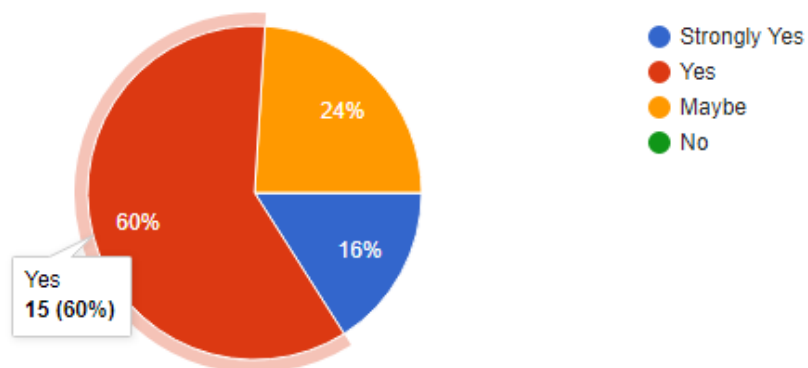


Figure 12 : Question 01 of survey 01.

Question 02: -

Do you think, the appraisers are spending unnecessary time to do the employee performance evaluation manually?

25 responses

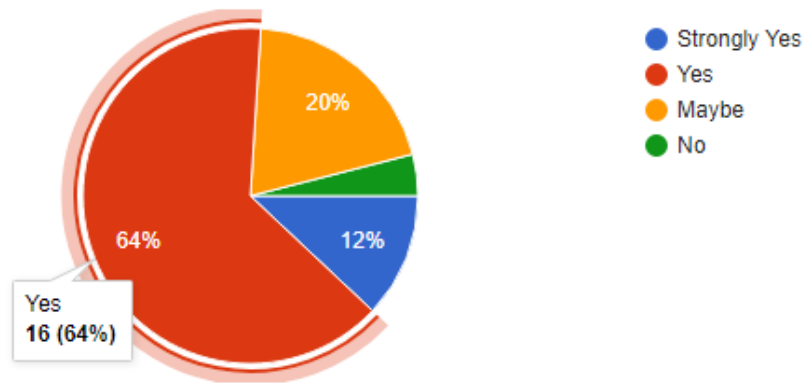


Figure 13 : Question 02 of survey 01.

Question 03: -

Do you think managers or the selectors has to spend extra hours when finding most appropriate employees for new project?

25 responses

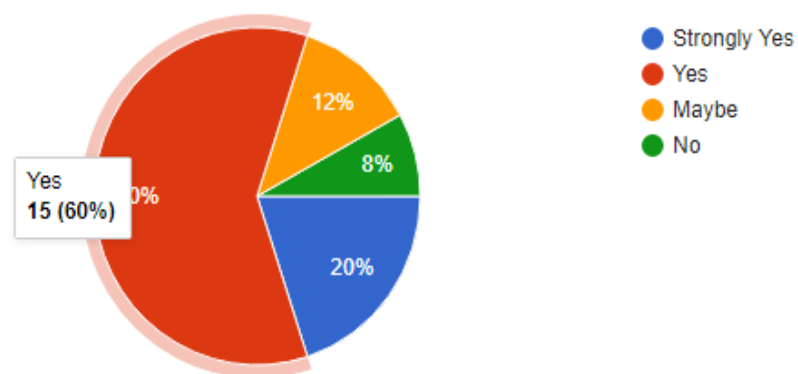


Figure 14 : Question 03 of survey 01.

Question 04: -

Do you think this is a real practical problem that every managers has to face, when selecting appropriate human resources for any new project?

25 responses

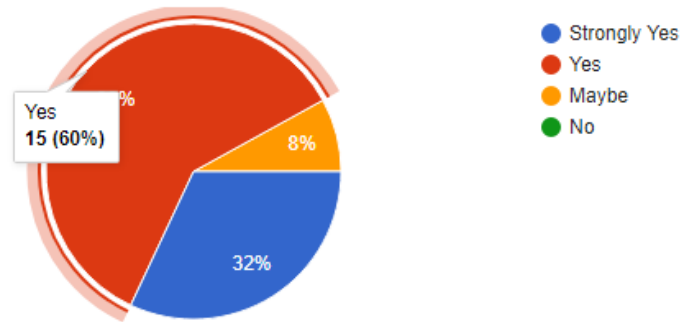


Figure 15 : Question 04 of survey 01.

Question 05: -

Do you really recommended to have this kind of software solution for your company?

25 responses

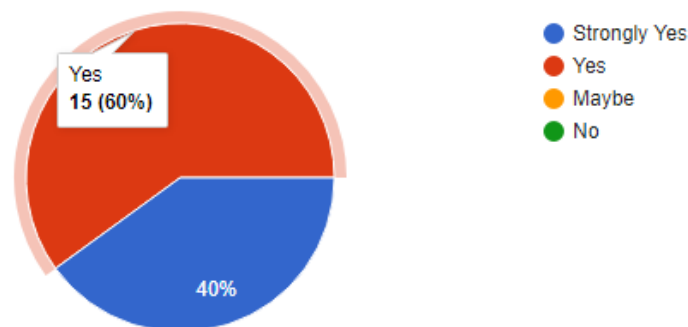


Figure 16 : Question 05 of survey 01.

According to the summary of each question, we can clearly get an idea about the final result of the survey. There were few participants who gave the negative answers and the majority of the participants are answered as “Strongly Yes” or “Yes”.

The survey 01 has been done for 25 people and based on that the final result is calculated to prove the necessity of the project based on five questions. (Please refer the appendix to get the actual result of the survey)

	Q1	Q2	Q3	Q4	Q5	Mark	%
Participant 1	4	4	3	3	4	18/20	90
2	2	3	4	4	3	16/20	80
3	4	3	3	3	3	16/20	80
4	2	2	3	3	3	13/20	65
5	3	3	1	2	3	12/20	60
6	2	3	3	3	3	14/20	70
7	3	3	4	4	4	18/20	90
8	2	3	3	3	3	14/20	70
9	3	2	3	4	4	16/20	80
10	3	3	2	2	3	13/20	65
11	3	4	4	4	4	19/20	95
12	3	3	2	3	4	15/20	75
13	3	4	4	4	3	18/20	90
14	4	2	3	3	4	16/20	80
15	3	3	3	3	3	15/20	75
16	4	3	3	3	3	16/20	80
17	2	3	3	3	3	14/20	70
18	3	3	3	3	4	16/20	80
19	3	2	3	4	3	15/20	75
20	3	2	3	3	3	14/20	70
21	3	3	1	3	3	13/20	65
22	3	3	4	4	4	18/20	90
23	3	3	3	3	4	16/20	80
24	3	3	3	4	4	17/20	85
25	2	1	2	3	3	11/20	55
Total percentage of all participants.							1915

Table 5 : Final mark calculation – Survey 01.

Total average success of the necessity of the project (based on 25 participants) = $1915/25 = 76.6\%$.

Finally, based on the 5 questions and the answers which were given by 25 participants, the majority (76.6%) of the people has been agreed with the concept and they think this is essential to be developed to control the problem.

4.2. Survey 02 – (Overall outcome of the project)

I have demonstrated the solution to group of well experienced IT persons as well as the non-IT persons who are doing the appraisals and who working as the selectors to allocating human resources for new project. After the demonstration, I have conducted the survey 02 and got the feedback from 10 participants.

4.2.1. Part A - (Evaluation of the concept and the system)

The first part of the survey 02 is consist of 6 main questions and there is a field to enter the overall comment. The 6 questions are mainly focused on the evaluation of the concept & the system.

There are two types of questions which can get maximum of 4 marks and maximum of 5 marks.

Based on the marking scheme, the final result of each question of the first part (Part A) has been showed as below,

Question 01: Do you think the demonstrated system is addressed the above problem?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(2/4)	(3/4)	(4/4)	(3/4)	(3/4)	(3/4)	(3/4)	(3/4)	(3/4)	(3/4)
*100	*100	*100	*100	*100	*100	*100	*100	*100	*100
=50	=75	=100	=75	=75	=75	=75	=75	=75	=75

Table 6 : Results of Q1 based on 10 users – Survey 02 (Part A)

Average score for Q1 based on 10 users = $750/10 = \underline{75\%}$

Question 02: Do you think the concept is hard to understand by Non-IT end users?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(4/4)	(3/4)	(3/4)	(4/4)	(4/4)	(4/4)	(3/4)	(3/4)	(2/4)	(3/4)
*100	*100	*100	*100	*100	*100	*100	*100	*100	*100
=100	=75	=75	=100	=100	=100	=75	=75	=50	=75

Table 7 : Results of Q2 based on 10 users – Survey 02 (Part A)

Average score for Q2 based on 10 users = $825/10 = \underline{82.5\%}$

Question 03: Do you think system is produced an accurate result?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(3/4)	(3/4)	(3/4)	(2/4)	(2/4)	(3/4)	(2/4)	(2/4)	(3/4)	(3/4)
*100	*100	*100	*100	*100	*100	*100	*100	*100	*100
=75	=75	=75	=50	=50	=75	=50	=50	=75	=75

Table 8 : Results of Q3 based on 10 users – Survey 02 (Part A)

Average score for Q3 based on 10 users = $650/10 = \underline{65\%}$

Question 04: How do you rate the selection criteria of employees (Suggestion Engine)?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(3/5)	(4/5)	(4/5)	(4/5)	(4/5)	(4/5)	(3/5)	(2/4)	(3/5)	(3/5)
* 100	* 100	* 100	* 100	* 100	* 100	* 100	*100	* 100	* 100
=60	=80	=80	=80	=80	=80	=60	=50	=60	=60

Table 9 : Results of Q4 based on 10 users – Survey 02 (Part A)

Average score for Q4 based on 10 users = $690/10 = \underline{69\%}$

Question 05: Are you satisfy with graphical user Interfaces?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(4/5)	(3/5)	(3/5)	(3/5)	(4/5)	(3/5)	(4/5)	(3/5)	(4/5)	(2/4)
* 100	* 100	* 100	* 100	* 100	* 100	* 100	* 100	* 100	*100
=80	=60	=60	=60	=80	=60	=80	=60	=80	=50

Table 10 : Results of Q5 based on 10 users – Survey 02 (Part A)

Average score for Q5 based on 10 users = $690/10 = \underline{69\%}$

Question 06: How do you rate this software application?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(3/5)	(4/5)	(4/5)	(4/5)	(4/5)	(4/5)	(3/5)	(3/5)	(3/5)	(2/4)
* 100	* 100	* 100	* 100	* 100	* 100	* 100	* 100	* 100	*100
=60	=80	=80	=80	=80	=80	=60	=60	=60	=50

Table 11 : Results of Q6 based on 10 users – Survey 02 (Part A)

Average score for Q6 based on 10 users = $690/10 = \underline{69\%}$

According to the overall result of 6 questions of the Part A, 71.58% has been given a positive feedback.

4.2.2. Part B - (Evaluation of weight based KPIs)

The Part B is contained of 3 questions and only 1 question has been taken to evaluate the concept of weighted average KPI. After the demonstration, I have explained about the concept of weighted average mathematical calculation and how it works. Furthermore, I have discussed about the weight assigning for the KPIs and final grading mark generation with the HR team of my current work place and make sure the mathematical approach that I have used to calculate the final performance result has follow the correct way to identify the high performers based on their individual KPI marks.

Question 01: If you understand the mathematical concept, do you think this is a good technique to use for the KPI calculations rather defining KPI as questionnaires?

User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10
(3/5)	(4/5)	(4/5)	(3/5)	(4/5)	(4/5)	(3/5)	(3/5)	(2/4)	(3/5)
* 100	* 100	* 100	* 100	* 100	* 100	* 100	* 100	*100	* 100
=60	=80	=80	=60	=80	=80	=60	=60	=50	=60

Table 12 : Result of Q1 based on 10 users - Survey 02 (Part B)

Average score for Q1 based on 10 users = $690/10 = \underline{69\%}$

Hence, Overall result of the Part B is 69%.

Finally, based on the survey 02, it is possible to conclude that overall success of this concept and the methodologies that have been used for the project is 70.29%. Therefore, this project concept is a good software solution for selecting the appropriate employees for any new project.

CHAPTER 5: CONCLUSION AND FUTURE WORK

5.1. CONCLUSION

As it is described in above chapters, the employee evaluation is an essential work for every organization or the company. Hence, employees are valuable assets of an organization and the key to success. Most of the companies have to struggle when they utilize the human resource asset for company betterment. Because they don't get adjust for the new human resource concepts or they still stick to traditional performance evaluations. We are in a competitive world since, cultural and theoretical change is completely necessary to move a company from a deeply followed traditional performance management systems to something new. So, the simple and accurate procedures have been used, in order to conduct the employee appraisal evaluations in a good way.

As a solution for the above realty problem, the software framework has been developed and it is capable enough to provide the functionalities for the end users to customize the entire evaluation process with followed by a best evaluating method. The framework facilitated the weighted average mechanism to create dynamic KPIs and competencies of individual tasks of employees which will contributes towards the accomplishment of organizational objectives.

Furthermore, companies are struggling, when they need to allocate an appropriate human resource for a newly upcoming project. This is a tedious task for the top management since, they have to look for each employee's profile. Sometimes wrong person can be allocated for a project. In this project, the new concept called "suggestion engine" has been introduced as the solution for allocating most suitable employees for any new project based on the performance evaluation marks, project filter variables and the framework allow for the end user to map the KPIs that are required for the project. Based on all above it can be concluded as this creates the new era of evaluating employee performance and recognition of an employee.

5.2. FUTURE WORK

As the future work of employee performances, we can use artificial intelligence to execute the same process of employee performance evaluations and recognitions. AI-driven technology that leverages data can help reduce certain biases that can impact the efficacy of performance reviews. For example, giving managers tools to immediately identify changes in performance, in real time, can eliminate biases that may otherwise plague the performance review process. In addition, real-time feedback supports managers by giving them the tools to immediately identify, evaluate, and correct, operational inefficiencies. [20] Further, enhancements can be done for the suggestion engine since, we can integrate the live project management tools as a service to the engine, in order to measure the day to day work activities and it is also can be used as an input variable when suggesting a suitable employees when there is a newly project comes.

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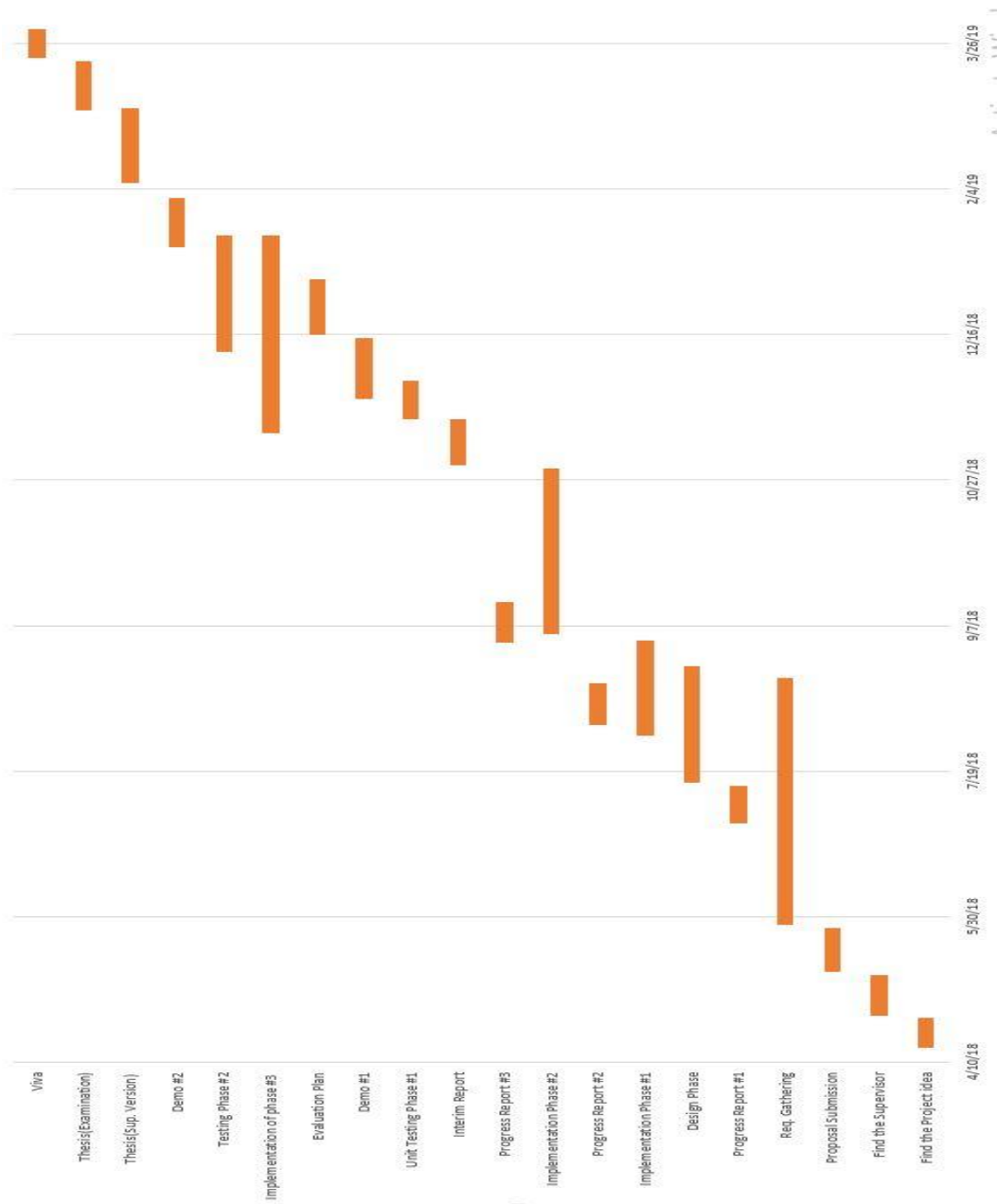
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APPENDIX

APPENDIX A: PROJECT PLAN



APPENDIX B: SURVEY 01

QUESTIONS

RESPONSES

25

“Using web services, Develop an Application Framework for Employee Performance Evaluation & Recognition.”

This questionnaire is a part of a research material for my master thesis. It would be great pleasure if you could fill out this questionnaire.

* Target Audience : Appraisers / Managers / Team Leads / IT Professional and Non-IT Users.

* Description :

A project based companies have a critical common problem when selecting or allocating human resources for newly upcoming projects. The manual selection procedure is a tedious task for the managers or the selectors, since they have to spend more time to find out the most suitable employees out of hundreds or thousands of employees for a new project and it is not practical to keep records of all the employee performances in mind. Most of the companies are still following a manual paper based performance evaluation process and it will lead to biases. Further, most of the companies are not following a proper mechanism to identify the most appropriate employees for a new project.

As the solution for the employee recognition, there should be a separate mechanism which is called the suggestion engine and that can be used to suggest the most suitable employees for a new project which is run on top of the application framework. The engine is running an algorithm by taking the different data from various data sources through web services such as performance evaluation marks, project filter variables and the priority level of the KPIs that are required for the project.

Email address *

Valid email address

This form is collecting email addresses. [Change settings](#)

What is your current workplace? *

Short answer text

What is your designation? *

Short answer text

How many working experience you have? *

Short answer text

...

Are you aware of the concept or method of employee performance evaluation & recognition?

- Strongly Yes
- Yes
- Maybe
- No

Have you ever heard about any existing software product which gives a solution for the above problem? *

- Strongly Yes
- Yes
- Maybe
- No

Do you think 360 degree performance evaluation is a good method to evaluate an employee performance?

- Strongly Yes
- Yes
- Maybe
- No

Do you think, the appraisers are spending unnecessary time to do the employee performance evaluation manually? *

- Strongly Yes
- Yes
- Maybe
- No

Do you think managers or the selectors has to spend extra hours when finding most appropriate employees for new project? *

- Strongly Yes
- Yes
- Maybe
- No

Do you think this is a real practical problem that every managers has to face, when selecting appropriate human resources for any new project? *

- Strongly Yes
- Yes
- Maybe
- No

Do you really recommended to have this kind of software solution for your company? *

- Strongly Yes
 - Yes
 - Maybe
 - No
-

APPENDIX C: RESULTS OF SURVEY 01

A	B	C	D	E	F	G	H	I	J	K	L
Timestamp	Email Address	What is your current workplace?	What is your designation?	How many working experience you have? the concept or method of employee performance evaluation & recognition?	Are you aware of the concept or method of employee performance evaluation & recognition?	Have you ever heard about any existing software product which gives a solution for the above problem?	Do you think 360 degree performance evaluation is a good method to evaluate an employee performance?	Do you think the appraisers are spending unnecessary time to do the employee performance evaluation manually?	Do you think managers or the selectors has to spend extra hours when finding most appropriate employees for new project?	Do you think this is a real practical problem that every managers has to face, when selecting appropriate human resources for any new project?	Do you really recommended to have this kind of software solution for your company?
1											
2	4/28/2019 11:07:50	bleetajayasoda2@Pearson Lanka	Quality Engly	4.5 yrs	Strongly Yes	No	Strongly Yes	Strongly Yes	Yes	Yes	Strongly Yes
3	4/28/2019 11:10:59	m.c.a.amarasingh SLIIT	Lecturer	3	Strongly Yes	No	Maybe	Yes	Strongly Yes	Strongly Yes	Yes
4	4/28/2019 11:48:12	gayan.de.silva88@Calcey Technologies	Project Manager	8+	Yes	Maybe	Strongly Yes	Yes	Yes	Yes	Yes
5	4/28/2019 12:08:16	aklilaveeratunga@virtusa	associate consulta	3 years 3 months	Yes	No	Maybe	Maybe	Yes	Yes	Yes
6	4/28/2019 12:11:44	sahan.vickramasi@bleeta pvt Ltd	Software engineer	2.3	Yes	Yes	Yes	Yes	No	Maybe	Yes
7	4/28/2019 12:16:15	maadushika110@g.bleeta Pvt Ltd	Engineer - QA	5+ years	Yes	Yes	Maybe	Yes	Yes	Yes	Yes
8	4/28/2019 12:47:25	yoshiposhi9@gm:bleeta (Pvt) Ltd	Lead Software Eng	4+ Years	Strongly Yes	Yes	Yes	Yes	Strongly Yes	Strongly Yes	Strongly Yes
9	4/28/2019 13:10:11	rajitha.vrtu@gmail Fortude (Pvt) Ltd	Systems Lead	8	Yes	Yes	Maybe	Yes	Yes	Yes	Yes
10	4/28/2019 14:10:37	jude8899@ymail / SLIT	Assistant Manager	11 years	Yes	Yes	Yes	Maybe	Yes	Strongly Yes	Strongly Yes
11	4/28/2019 15:22:37	rangan@gmail.com PBSS	Project Manager	15 years	Yes	Maybe	Yes	Yes	Maybe	Maybe	Yes
12	4/28/2019 15:48:55	laksaraupeshana Alpha maldives	IT Manager	2 years	Strongly Yes	Maybe	Yes	Strongly Yes	Strongly Yes	Strongly Yes	Strongly Yes
13	4/28/2019 16:32:31	aklilashanperies Bell solutions pvt ltd	Engineer	4 years	Yes	Maybe	Yes	Yes	Maybe	Yes	Strongly Yes
14	4/28/2019 17:12:41	sithsuc@gmail.com Cystal Martin Ceylon	P Assistant Manager	2 years	Strongly Yes	Yes	Yes	Strongly Yes	Strongly Yes	Strongly Yes	Yes
15	4/28/2019 17:33:29	achitha_silva@Private bank	Junior Executive	8 yrs	Strongly Yes	Yes	Strongly Yes	Maybe	Yes	Yes	Strongly Yes
16	4/28/2019 18:39:14	heximalasorjia@bleeta Pvt Ltd	QA Engineer	2 years	Strongly Yes	No	Yes	Yes	Yes	Yes	Yes
17	4/28/2019 20:23:05	m.jestin21@gmail Arimac	Quality assurance	Around 1 year	Yes	Maybe	Strongly Yes	Yes	Yes	Yes	Yes
18	4/28/2019 20:32:19	alithmuna55@gm: Sri Lanka Insurance Co Consultant	Co Consultant	40+ Years	Yes	No	Maybe	Yes	Yes	Yes	Yes
19	4/28/2019 20:42:15	dnhithminura@gm: Eyepax IT Consulting (Software Engineer)	Software Engineer	3 years	Yes	No	Yes	Yes	Yes	Yes	Strongly Yes
20	4/28/2019 21:15:51	danushnamada@CFA Corporate, USA	Director of Brand	(9 years	Yes	Yes	Yes	Maybe	Yes	Strongly Yes	Yes
21	4/28/2019 21:19:00	chamathran@gm: Champ Soft (pvt) LTD	Senior Software Eng	5 years	Yes	Maybe	Yes	Maybe	Yes	Yes	Yes
22	4/28/2019 21:26:57	ihari.danushi@gm Pan asia bank	Executive	6	Yes	Yes	Yes	Yes	No	Yes	Yes
23	4/28/2019 22:32:11	ijayarathana@g PBSS	Pre Sales Consult	12	Yes	Yes	Yes	Yes	Strongly Yes	Strongly Yes	Strongly Yes
24	4/29/2019 0:56:02	nasaritha22@gm: Blueberry Consultants	Software engineer	3 years	Yes	No	Yes	Yes	Yes	Yes	Strongly Yes
25	4/29/2019 9:35:32	amalka@uvu.ac.lj Uva Wellassa Universit	Lecturer (Probator)	4 years	Yes	No	Yes	Yes	Yes	Strongly Yes	Strongly Yes
26	4/29/2019 19:12:49	gweelvitigoda@gm:bleeta Pvt Ltd	QA Engineer	3.5 years	Yes	No	Maybe	No	Maybe	Yes	Yes

APPENDIX D: SURVEY 02

This questionnaire is a part of a research material for my master thesis. It would be great pleasure if you could fill out this questionnaire.

Target Audience: Appraisers / Managers / Team Leads / IT Professionals and Non-IT Users.

Problem Statement:

A project-based companies have a critical common problem when selecting or allocating human resources for newly upcoming projects. The manual selection procedure is a tedious task for the managers or the selectors, since they have to spend more time to find out the most suitable employees out of hundreds or thousands of employees for a new project and it is not practical to keep records of all the employee performances in mind. Most of the companies are still following a manual paper-based performance evaluation process and it will lead to biases. Further, most of the companies are not following a proper mechanism to identify the most appropriate employees for a new project.

Proposed Software Solution:

As the solution for the employee recognition, there should be a separate mechanism which is called the suggestion engine and that can be used to suggest the most suitable employees for a new project which is run on top of the application framework. The engine is running an algorithm by taking the different data from various data sources through web services such as performance evaluation marks, project filter variables and the priority level of the KPIs that are required for the project. The framework has the capability of defining the KPIs with preferred value additions and the grading mechanisms that would slot in to the requirements of the company. It would also produce an average mark of past evaluation in order to get an idea about the employee performance growth throughout the past years.

What is your designation?

How many working experiences you have?

Part “A” (Evaluation of the concept & the system)

1. Do you think the demonstrated system is addressed the above problem?

No Maybe Yes Strongly Yes

2. Do you think this concept is hard to understand by Non-IT end users?

No Maybe Yes Strongly Yes

3. Do you think the system is produced an accurate result?

No Maybe Yes Strongly Yes

4. How do you rate the selection criteria of employees (Suggestion Engine)?

Outstanding Above standard Standard Below standard
Poor

5. Are you satisfy with graphical user interfaces?

Outstanding Above standard Standard Below standard
Poor

6. How do you rate this software application?

Outstanding Above standard Standard Below standard
Poor

- **What is your overall comment for Part “A”?**

Part “B” (Evaluation of weight based KPIs)

As I described you, the end user can assign a weight for KPI according to the important level of the company. The following example will describe how the weighted KPI calculation is working inside the framework and what is the reason for define a weight for each KPI.

M_i : - The mark scored by the employee for each KPI in their employee evaluation.

V_i : - The maximum value for the KPI which is defined by the company.

W_i : - Weight for the KPI.

W : - Total KPIs weight.

N : - Total number of KPIs.

Total weighted average score for KPIs =

$$\frac{\sum_{i=1}^N ((M_i/V_i) * 100) * W_i}{\sum_{i=1}^N W_i}$$

Example: - There can be few employees who is getting more leaves but they may have delivered the quality product within the deadline. Another group of employees can be exists with good attendance but they may be fail to deliver the quality product. In this kind of situations, the company could decide whether they need to give the priority by assigning weight for the “attendance KPI” or the “quality of work KPI”.

(KPI/Competency)	Weight	Employee (Mark for each KPI/Competency)
Attendance (KPI)	W_{K1}	$(M_{K1}/V_{K1}) * 100 = R_{K1} \%$
Quality of work (KPI)	W_{K2}	$(M_{K2}/V_{K2}) * 100 = R_{K2} \%$
Team Player (Competency)	W_{C3}	$(M_{C1}/V_{C1}) * 100 = R_{C3} \%$
Communication (Competency)	W_{C4}	$(M_{K1}/V_{K1}) * 100 = R_{C4} \%$

Table 1: Example of weighted average calculation of KPI and Competency.

$$\text{Weighted Average for KPI (S}_k\text{)} = \frac{W_{K1} * R_{K1} + W_{K2} * R_{K2}}{W_{K1} + W_{K2}}$$

$$\text{Weighted Average for Competency (S}_c\text{)} = \frac{W_{C3} * R_{C3} + W_{C4} * R_{C4}}{W_{C3} + W_{C4}}$$

Total Evaluation Mark=(S_k*Contribution of KPI %)+(S_c*Contribution of Competency %)

**** W_{K1} , W_{K2} , W_{C3} and W_{C4} can be define according to the priority level of the company.**

1. Have you ever heard about weighted average calculation?

No Maybe Yes Strongly Yes

2. Do you understand the weighted average mathematical equation?

No Maybe Yes Strongly Yes

3. If you understand the mathematical concept, do you think this is a good technique to use for the KPI calculations rather defining KPI as questionnaires?

Outstanding Above standard Standard Below standard
Poor

- **What is your overall comment for Part “B”?**